PROCEEDINGS OF THE WORKSHOP ON

THE PREVAILING ACTIVITIES ON THE LAKE VICTORIA BASIN WITH PARTICULAR REFERENCE TO THE FISHERIES OF THE LAKE

Mwanza 8—9 March, 1990

ASPECTS OF MIGRATION, SIZE STRUCTURE AND MORTALITY OF JUVENILE NILE PERCH IN THE MWANZA GULF OF LAKE VICTORIA

E.,F.B. KATUNZI

A detailed study of the early life of fishes forms one of the very important aspects with respect to recruitment mechanism and proper understanding of the dynamics leading to sustainance of fish populations. It should be the central theme of the fisheries biologist and managers to extract the biological information relevant to the proper understanding of this part of the population. A number of studies in the Mwanza gulf and Lake Victoria have emphasized the need to monitor the fishery by conducting observations on stock size, migration, catch effort data and growth of big specimen (Acere 1981, Goudsward et al 1984, Asila. Ogari 1988 and Okemwa 1984). The present paper discusses the preliminary information on the size structure, mortality and migration of juvenile Nile perch. The long term objectives of the programme is aimed at describing the size structure, growth, mortality, recruitment pattern and population dynamics of the Nile perch up to 30 cm total length in the Mwanza Gulf.

Various forms of fish movement have been described by Harden Jones 1968. It is, however, beyond the scope of this paper to elaborate on the theories behind these movements but an attempt is made to identify the type of movement and describe the location of the fishes at different times of the year.

It is a general observation that juvenile fishes take a different migration pattern from that of the adults. Some ealier studies had indicated the juvenile Nile perch to stay at the bottom during the day and moving some distance above the botom during the night (Wannink per comm). The adult fishes, however remain at the bottom for most of the time.

Identification of patterns of fish movements is important for explaining bias in interpreting progressin of modes and calculating the mortality of migratory stocks.

Migration should also be studied to solve the complex of problems arising from shared stocks between countries. Detailed information and defenition of shared stocks are discussed by Caddy (1982, 1987) Cady and Garcia 1986).

Studies of the early and late larval stages of *L. niloticus* have been done in Lake Chad Hopson 1972. Juvenile fishes have been found to stay in shallow sheltered bays before they migrate to the recruitment grounds. Studies from tagging experments in the Mwanza gulf have revealed the Nile perch not to be a highly migratory species (Lingtvoet and Mkumbo 1990). However, the fact that in troductions were made in the Kenyan and Ugandan waters and the fish now occupies the whole lake is a sure proof of migration.

Materials and methods

The young fishes up to 30 cm total length were collected by means of bottom trawls 19 mm stretched mesh. The study area consists of four strata of different depth profiles: Busumu (1-3m), Luansa 3-4), Nyegezi (11-13) and Entrance (19-24) (Fig. 1). Four trawl hauls were made in each stratum once everv month from September 1988 to Septemba 1989.

Length frequency data per station were recorded and stored using lotus software package and length frequency plot made with printgraph. The mean length and catch per unit effort were calculated.

For the three strata i.e. Busumu, Luansa, and Nyegezi the area was estimated by means of a millimeter scale and the catch per unit effort of pooled data of the three stations raised to the whole area. Estimation of mortality was by the catch curve routine of the elefan package.

Results and discussion

The catch per unit effort and mean lengths of the fishes are shown in table 1, whereas the length frequency plot are shown in Fig. 1. The period of September and October was characterised by very high numbers of the juvenile in the shallow stations of Busumu and Luansa. This is the peak period (table 1). The catch per unit effort suggests a non-uniform distribution of the juvenile fishes in time and space.

The Nyegezi location exihibited a different size structure. There is a comparatively big number of fishes in this area at the time of the peak in the shallow waters. The second peak which is observed in May, June and July is only limited to Nyegezi and Entrance. The general feature of the Busumu and Luansa was a relatively low mean length particularly in the period of September and October when the large number of juvenile was extremely high. The mean length in September and October in Busumu and Luansa Bay, ranges between 4.8-7.9 cm, it extends from 8.8-15.8 cm in the deeper stations of Nyegezi and Entrace. Low mean lengths are similarly observed in the Nyegezi station in the later months of April, May, June and July. This can be explained by the reason that the Nile perch has two breeding periods one in the shallow parts and the other in the deeper stations.

Analysis of the means in both Busumu and Luansa indicate very little progression of modes throughout the months. For a period of one year (September 1988-September 1989) the apparent growth increment is 6.2 cm for Busumu (Table 1). Similarly the increment is 3.9 cm for fishes caught in the Luansa Bay.

Assuming Loo of 200 cm and K of 0.2 for the Nile perch, the fish is capable of growing up to 22 cm in one year. he Mean length difference from September 1988 to September 1989 is too small to account for growth of the fishes. The length frequency distribution of the fishes caught in Busumu and Luanso exhibit a unimodal distribution at mean lengths shown in table 1 and Fig. 1. On the other hand a bimodal distribution of frequencies occurred at the Nyegezi and Entrace (Fig 1). Preliminary investigations on the breeding behaviour of Nile perch have revealed continuous breeding with two peaks in a year (Ligtvoet 1989). This should be reflected as a bimodal distribution of frequencies. The prevailance of a unimodal size structure and the apparent negative growth at the Busumu and Luansa could be a result of one of the following explanations.

* There could have been continuous brreding hence lowering the mean length through time.

* Juvenile fishes might be moving in from the deeper stations of to the Busumu and Luansa hence keeping the mean length low.

* The larger fishes may have died off as a result of natural causes or due to fishing and hence made unavailable to the trawl.

Since the catch per unit of effort at Busumu and Luanso has continuously been droping and at the same time staying relatively high at the Nyegezi station, it does not seem likely that movement of fishes may have been from the deeper to shallower stations. Similarly selective mortality on the larger fishes was not sited during the observation. The only plausible explanation is that the relatively larger fishes move to the deeper stations as they grow larger hence leaving the much smaller fishes that fall to the trawls.

The size structure at Nyegezi Station exhibits a different pattern. Whereas in Busumu and Luansa a slight progression of the mean occurs, there is no obvious trend of the means at Nyegezi. Observation on the cpue indicates the highest catches of fish from this station. This coupled with the permanent bimodal distribution of the length frequency suggests little movement of the fishes from this station to the shallower parts of Busumu.

The cpue data pooled for the three stations of Busumu Luanso, and Nyegezi showed a continuous decay in numbers. The total mortality estimate from the catch curve of the pooled data was of the magnitude of 3.5. This index is extreamely high. Since there is no mortality due to fishing on this part of the population and migration of the fishes in and out of the Gulf it is compesated for by pooling the data and raising to the Gulf area, the major cause of mortality is due to cannibalism (Katunzi in perp.)

Acere, T.O. 1985. Observations on the biology, age, growth, maturity and sexuality of Nile perch. *Lates niloticus* (linne) and gwoth of its fishery in the northern waters of Lake Victoria. In CIFA report of the third session of the sub-committee for the Development and Management of the Fisheries of Lake Victoria, 4-5, October 1984, Jinja, Uganda. FAO Fish. Rep. 335:42-61

Asila, A.A., J. Ogari 1988. Growth parameters and mortality rates of Nile perch *(Lates niloticus)* estimated from length frequency data in the Nyanza Gulf (Lake Victoria). FAO Fish. Rep. 389-287.

Caddy, J.F., 1982. Some considerations relevant to the defenition of shared stocksand their allocation between adjacent economic zones F.A.O. Fish, Circ. 749:44p.

Caddy, J.F. 1987 Types of resource sharing relevant to Lesser Antilles Stocks. F.A.O. Fish, Rep. 383:115-24.

Caddy, J.F. and S. Garcia, 1986. Fisheries thematic mapping a pre-requisite of fisheries. Oceanogr. Trop. 21 (1):31-52.

Goudswaard, P.C. and F, Witte 1984. Observations on Nile perch *Lates niloticus* (L.1758) in the Tanzanian part of Lake Victoria. In CIFA report of the third session of the Sub-Committee for the Development and Management of the fisheries of Lake Victoria, FAO Fish. Rep. 355:62—67.

Harden, Jones, F.R. 1986. Fish migration. London, Arnold, 325 p.

Hopson, A.J. 1972. A.J. 1972. A study of the Nile perch, *Lates niloticus* Overseas Res. Publ. Lond. 19: 93p 27 fig.

Ligtvoet. W. and O.C. Mkumbo. 1990. Synopsis of econological and fishery research on Nile perch *(Lates niloticus)* in Lake Victoria conducted by HEST/TAFIRI. Report from Hapolchromis Ecology Survey Team and the Tanzania Fisheries Research Institute TAFIRI operating in Lake Victroria No. 50.

Okemwa E. 1984 Potential fishery of the Nile perch *Lates niloticus* (Linne) (Pisces Centropomidae) in Nyanza Gulf of Lake Victoria East Africa. Hydrobiologia 108 (2) 121:126.